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## ANALYSES,

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- I.—*Analysis of a Narrative of a Voyage to the Pacific and Beering's Strait, to co-operate with the Polar Expeditions*; performed in his Majesty's Ship Blossom, under the Command of Captain F. W. Beechey, R.N., F.R.S., &c., in the years 1825, 26, 27, and 28. By W. Ainsworth, Esq.

HIS Majesty's ship Blossom was sent out by his Majesty's government, with a special commission to prosecute researches on the practicability of a north-west passage, and being destined for a long voyage, through seas of different characters, and in very opposite climates, was consequently more fitted up with a view of administering to the necessities and comforts of the officers and men, and providing for the safety of the vessel, than prepared for the slow and lengthened labours of science, or the nicety of observation and experiment.

The instructions, however, given to Captain Beechey by the Board of Admiralty, in addition to the co-operation to be given to the polar expedition, directed him to make geographical observations, of much interest, on the doubtful existence of some islands in the South Pacific, to survey the group of the Society Islands, to direct his course to the Navigators' Islands, and to afford every assistance to the naturalist of the expedition in making collections illustrative of his branch of research.

The additions made to our knowledge of the South Pacific and other seas, with their coasts and islands, by this expedition, will be best given in the shape of a succinct narrative, or an analysis of Captain Beechey's published work; and we shall afterwards give a general idea of the results of the observations and experiments made during the voyage, which, from their variety, number, and exactness, reflect the greatest credit on the science, industry, and perseverance of Captain Beechey, and the officers under his command.

On the 19th of May, 1825, the vessel weighed from Spithead, steering out of the Channel with a fair wind. On the 30th of the

same month, it was ascertained that a reef of rocks, named the Eight Stones, did not exist in the situation which for a number of years they have occupied in our charts. From Cape Finisterre to Point Naga the error in the direction S. 33° W. was not less than ninety miles. The position of the island of Fernanda Noronha was found, on the 26th of June, to be eighteen miles eastward of the position given in the East India Directory.

On the 11th of July they arrived at Rio Janeiro, where they remained until the 13th of August, on which day they sailed for the Pacific. During their stay they measured the height of the Peak of Corcovado, a mass of granite overlooking the placid waters of Bota-Fogo; and after checking these by observations repeated three years afterwards, the height, by trigonometrical measurement, was found to be 2306 feet in the first instance, and 2305½ in the second. In making Cape Horn, on September 16, a current drifted the ship fifty miles to the northward in the twenty-four hours. On the 26th of September they were fifty leagues west of Cape Pillar\*. With regard to this navigation, Captain Beechey says, in his nautical remarks appended to the narrative, 'I concur in opinion with Cook, Perouse, Krusenstern, and others, in thinking there is no necessity whatever for going far to the southward; and I should recommend always standing on that tack which gained most longitude, without paying any regard to latitude further than taking care to keep south (say a degree) of Cape Horn.'

On the 6th of October they made the island of Mocha, on the coast of Chili. This island, once celebrated as a resort of the buccaneers, and thickly peopled, was found deserted by Captain Strong in 1690, and appears to have remained uninhabited ever since. On the 8th of the same month they anchored at Talcahuana.

In the survey of the Bay of Concepcion, a shoal was discovered by Lieutenant Belcher on the Penco side. It was also necessary to make some alterations in the position of the Belen Bank, from the manner in which it is laid down in the Spanish charts; and the shoal said to occur off the sandy point of Quiriquina does not at present exist.

The Blossom put to sea on the 24th, anchored three days afterwards at Valparaiso, and on the 29th took a final leave of the coast.

The island of Salas y Gomez, which was determined to be in latitude 26° 27' 46" S., and longitude 105° 20', has the appearance of three rocks. Its longest direction is N.W. and S.E., and its extent something less than half a mile in length, and a fifth of a

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\* Captain Beechey's text differs here from his nautical remarks by fifty leagues.

mile in width,—much less than has been stated. The surface was covered with rugged stones, of a dark brown colour, except where used as roosting places for the sea-fowl; and from some observations, it seems probable that the island is of volcanic origin.

Between Salas y Gomez and Easter Island, they passed near the situation of an island named Washington and Coffin, reported to have been discovered by an American ship, but without perceiving any traces of it, though within four leagues of the spot with a perfectly clear sky and horizon.

On the 17th of November they were off Easter Island. Captain Beechey is inclined to the opinion that this is the island upon which Davis had so nearly lost his vessel; and, considering the rapid current that exists in the vicinity of the Galapagos, and which extends throughout the trade-wind, though with diminished force, the error in that navigator's reckoning he does not think more than might have happened to any dull-sailing vessel circumstanced as his was. The Blossom, in passing from the meridian of Juan Fernandez to Easter Island, was set 270 miles to the westward in eighteen days. Easter Island is 2000 miles from the coast of Chili, and 1500 from the nearest inhabited island, Pitcairn Island excepted, which has been peopled by Europeans. The geographical description of the island given by Mr. Berniget, who was engineer to the Astrolabe, was found to be perfectly accurate\*. The population Captain Beechey estimates at about 1200. The natives tattoo themselves, so as to have the appearance of wearing breeches. Most of them go naked, though some wear the *maro*, which is made either of fine Indian cloth of a reddish colour, of a wild kind of parsley, or of a species of sea-weed. The straw hats mentioned by Cook and La Perouse appeared to be no longer in use. Captain Beechey thinks that the idea of there being a community of property among the islanders is extremely improbable. The interview of our navigators with them was very unfortunate, and terminated in a serious and unpleasant dispute.

Captain Beechey remarks, that those gigantic busts of stone which once existed on various parts of the island, of which Captain Cook found only two remaining, while Kotzebue found nothing more than a square pedestal in their place, have now altogether disappeared, and that a few heaps of rubbish only occupy a spot where it is doubtful whether one of the busts was erected or not. Pitcairn Island, he observes, affords a curious example of a race of men settling upon an island, erecting stone images upon its

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\* The highest part of it is 1200 feet, and in clear weather it may be seen at twelve or fourteen leagues distance.

heights, and either becoming extinct, or having abandoned it; and some circumstances connected with Easter Island occur in favour of the presumption that the same thing may also have taken place there. The most remarkable of these facts is, that the present generation is so nearly allied in language and customs to many islanders in the South Sea, as to leave no doubt of their having migrated from some of them; and yet in none of these places are there images of such extraordinary dimensions, or, indeed, in any way resembling them. The Easter Islanders have, besides, small wooden deities, similar to those worshipped by the inhabitants of the other islands just mentioned.

On the 28th of November the Blossom reached Ducie's Island. It is a coral rock, oval, with a lagoon in the centre, tenanted only by birds: the highest trees do not rise more than twenty-six feet above the level of the sea. It is situated in latitude  $24^{\circ} 40' S.$ , and longitude  $124^{\circ} 45'$ . The water was so clear over the coral, that the bottom could be distinctly seen when no soundings could be had with thirty fathoms of line. At seven miles distance, the island ceased to be visible from the deck.

On the 3d of December the ship reached Henderson's or Elizabeth Island, in latitude  $24^{\circ} 21'$ , and longitude  $128^{\circ} 18' W.$  This is of a peculiar formation, very few instances of which are known—viz., dead coral, more or less porous, elevated in a flat surface, probably by volcanic agency, to the height of eighty feet. It is five miles in length, one in breadth, and thickly covered with shrubs, which make it difficult to climb. It was named Henderson's Island by the commander of the *Hercules*, of Calcutta, though first visited by the crew of the *Essex*, an American whaler, two of whom landed on it after the loss of their ship, and were subsequently taken off by an English whaler, who heard of their fate at Valparaiso.

On the 4th of December the expedition arrived at Pitcairn Island. The mutiny on board the *Bounty*; the terrible fate of the surviving mutineers, who sought refuge on this island, which exhibits traces of former inhabitants, and which presents great variety of soil and aspect, and is, further, abundantly provided with fish, fowl, and vegetables; the reform of Adams and his companion, and the patriarchal colony that rose under their care; are admirably related by Captain Beechey, but are foreign to our present purpose of strict geographical inquiry; and we will therefore content ourselves with stating that the island is about seven miles in circumference, surrounded by cliffs, or rocky projections, off which lie scattered numerous fragments of rock, rising, like so many black pinnacles, amid the surf, which, on all sides, rolls in upon the shore; and that its highest point was found to be 1109 feet above the level of the sea. The population, from the

period of its first establishment to the time of Captain Beechey's visit, varied as follows :—

	Males. Females.	
The first settlers consisted of {	White (mutineers) . . . . .	9 0
	Coloured (Otaheiteans) . . . . .	6 12
		<hr/> 15 12=27
Of these were killed in quar-	White . . . . .	6 0
rels between the whites	Coloured . . . . .	6 0
and blacks. . . . .		<hr/>
by accident . . . . .	White . . . . .	1 3
Died a natural death. . . . .	— . . . . .	1 3
		<hr/> 14 6—1 went
		away.
The original settlers, therefore, found on the island		
by the Blossom were . . . . .	1	5
The children of the white settlers (the men of colour		
having left none). . . . .	10	10
Their grandchildren. . . . .	22	15
Recent settlers . . . . .	2	0
Child of one of them . . . . .	1	0
	<hr/> 36	<hr/> 30=66
Present population . . . . .		

On the 23d of December the Blossom reached Oeno Island, in latitude  $24^{\circ} 01'$  S., and longitude  $130^{\circ} 40'$  W. This island is a coral formation—including a lagoon with a small island in the centre, deep water all around, and a heavy surf. It is uninhabited, and was named Oeno Island after a whale ship, whose master supposed that it had not before been seen; but the discovery belongs to Captain Henderson, of the *Hercules*.

Crescent Island, which they reached on the 27th of the same month, is in latitude  $23^{\circ} 20'$ , or  $23^{\circ} 17'$  S. by another observation, and in longitude  $134^{\circ} 35'$  W. It is an oblong, three miles and a half in length, one and a half in width; and consists of a strip of coral about a hundred yards or less in width, having the sea on one side and a lagoon on the other. Its general height is two feet above the water. The soil, where highest, reaches just six feet above the sea,—and the tops of the trees are twenty feet higher. About forty natives were seen on this small spot; they were tall and well made,—tattooed, with thick black hair and beards. Three square stone huts, about six feet high, and sheds, some open on one side only, and others on both, were seen; but no cultivation could be discerned, nor any fruit-trees, which could have furnished subsistence.

On the 29th of December they reached the Gambier Islands. This group was discovered by the ship *Duff*, on a missionary voyage, in 1797, and named by Mr. Wilson, her commander.

It consists of five large islands and several smaller ones, all situated in a lagoon formed by a reef of coral, into which the *Blossom* effected a passage over a portion of the reef which dipped beneath the water, with five, seven, and eight fathoms, gradually deepening it to twenty-five fathoms. The largest island is about six miles in length, and rises into two peaks elevated 1428 feet above the level of the sea. These peaks, which were called after the Duff, are in form of wedges, and may be seen at a distance of fourteen or fifteen leagues. The island on which they occur Captain Beechey named after the first lieutenant, Peard Island; and the others in succession, Belcher, Wainright, Elson, Collie, and Marsh, after the other officers, and the lagoon, in which the ship was anchored, after herself. The islands appear to have been subjected to volcanic action, though not recently; and the account given of their geological structure, as extracted from Mr. Collie's Journal, gives details exactly similar to those presented by the older plutonic rocks in our own latitudes. The population may be estimated at about 1000; and the account given by Captain Beechey of their appearance, manners, dress, and occupations, of their mode of preserving the dead, and of their instruments of chase, warfare, and other utensils, presents many interesting features.

The Gambier Islands acquire considerable importance from the fact of their being the only station at present known (Pitcairn Island excepted) in a distance of 4000 miles between Otaheite and the coast of Chili, where a supply of good water can be procured. Two good streams from Mount Duff supplied the boats faster than it could be got off. Captain Beechey observed the old custom of taking possession of this group by hoisting the English ensign on the shore; and sowed several useful seeds, in the hope of their proving advantageous to the natives. At the S.W. extremity of these islands are several small sandy islands, over which the sea breaks heavily, so that they are lost amidst the foam. They were named the Wolfe Islands, from one of the midshipmen of the *Blossom*.

Lord Hood's Island, which Captain Beechey reached on the 14th of January, 1826, is in latitude  $21^{\circ} 30'$  S. and longitude  $135^{\circ} 33'$  W.; and consists of an assemblage of small islets rising from a chain of coral even with, or a little above the water's edge. Upon these grow a variety of evergreen-trees thickly set, and presenting an inviting appearance; but the surf forbade all attempts at landing. It appears, however, that the islets are not now inhabited, as Krusenstern reports them to have been, and as the appearance of a square stone hut was sufficient to prove. This coral rock, which was discovered by Mr. Wilson, in the ship *Duff*, is 11.2 miles in length and 4.7 miles in width, in a north and south

direction, and, like almost all the coral islands, contains a lagoon, and is steep on all sides.

The island of Clermont-Tonnerre, which was visited on the 18th of January, is ten miles in length, but very narrow, particularly at the extremities. It is of the same formation as Lord Hood's Island, but more elevated, and abounds with cocoa-nut trees. With the exception of a few breaks in the southern shore, by which the sea, when high, at times communicates with the lagoon, it is altogether above water. The lagoon has several small islands in it, and the shores all round are steep and abound with fish. The ship here encountered an unusually formidable water-spout, of which Captain Beechey gives an animated description, accompanied by a sketch of its appearance in three different stages of its progress. Captain Duperrey, in his voyage round the world, in the *Coquille*, visited this island, and, supposing it to be a new discovery, named it Clermont-Tonnerre, after the late French minister of marine. Captain Beechey seems, however, decided in his opinion that it was before discovered by the ship *Minerva*. The inhabitants are not above 200, and among them there was a great diversity of complexion. They were exceedingly shy, and the surf would not allow the *Blossom's* boats to land : latitude  $18^{\circ} 33' 42''$  S., and longitude  $136^{\circ} 01' 32''$  W.

Serle Island, the next visited, on January 21, is seven miles and a half in length, in a N.W. direction, and two miles and a quarter in width in its broadest part ;—its latitude is  $18^{\circ} 16' 01''$  S., and longitude  $137^{\circ} 00' 45''$  W. It is a low strip of coral formation, and has several clumps of trees, which have been mistaken by some navigators for hillocks. The population altogether cannot exceed 100, and they resemble the inhabitants of Clermont-Tonnerre or *Minerva* Island.

Whitsunday Island, discovered by Captain Wallis in 1767, is situated in latitude  $19^{\circ} 23'$  S., and longitude  $138^{\circ} 36'$  W., and forty miles to the westward of the place assigned to it by that navigator. A landing was effected here on January 23, and several huts were observed, with well-beaten pathways, and reservoirs for fresh water cut eighteen inches into the coral ; but no inhabitants were seen. The island is a mile and a half in length, and not four miles, as stated by Captain Wallis, steep all round, of coral formation, well wooded, and contains a lagoon.

The same evening they bore up for Queen Charlotte's Island, also discovered by Captain Wallis, in latitude  $19^{\circ} 17'$  S., and longitude  $138^{\circ} 42'$  W. The coral here had so grown up that no lagoon could be perceived in the centre, and not a single specimen was to be seen of the numerous cocoa-nut trees found by Captain Wallis.

Lagoon Island, visited on January 24, in latitude  $18^{\circ} 43' 19''$



S., and longitude  $138^{\circ} 47' 13''$  W., is three miles in length, in a W. by S. direction, and a mile and a quarter in width. Two cocoa-nut trees in the centre of the island, which, Captain Cook observed, had the appearance of flags, are still waving; and, altogether, the island preserves the appearances described by that great navigator. The inhabitants of Lagoon Island, with whom the Blossom had some communication, were honest and friendly, forming a striking exception to the general character of the natives of Polynesia.

Thrum-cap Island, discovered and so named by Captain Cook, is of coral formation, three-quarters of a mile in length, well wooded, and steep all round; but no lagoon could be perceived. Bougainville gave this island the name of *Les Lanciers*, in consequence of the men whom he saw on it being armed with long spears;—they were most probably visitors from Lagoon Island, as no inhabitants were now seen. Its latitude is  $18^{\circ} 30'$  S., and longitude  $139^{\circ} 08'$  W. The Blossom was off it on the afternoon of the 24th, but the surf prevented the boats landing.

Egmont Island, Captain Wallis's second discovery, is steep like most other coral islands, and well wooded, with cocoa-nut and pandanus-trees. The men were armed in the same manner as the Lagoon Islanders; were friendly, and bartered freely for iron. It was examined on the 25th of January, but without landing.

Barrow Island, situated in latitude  $20^{\circ} 45'$  S., and longitude  $4^{\circ} 07'$  W. of Gambier, or  $139^{\circ} 03'$  W. of Greenwich, was Captain Beechey's first discovery, on the 26th of January. It is a mile and three-quarters in length from north to south, and a mile and three-tenths in width; it consists of a narrow strip of land, of an oval form, not more than 200 yards wide in any part, well wooded, with three large pits under the trees, containing several tons of fresh water. It has a lagoon in its centre, which the colour of the water indicated to be of no great depth. Traces, apparently of Europeans, were observed on this island; but they were afterwards found to be the relics of the brief residence on these shores of some natives of the Chain Islands who had lost their way.

On the 2d of February the ship reached Captain Edwards' Carysfoot Island. It is a strip of coral so low that the sea washes into the lagoon in several places. Vegetation is scanty, but there are no dangers near the island. It is in latitude  $20^{\circ} 44'$  S., and longitude  $138^{\circ} 22'$ .

The lagoon of Osnaburgh Island of Carteret, the next island visited, on the 3d of February, and which Captain Beechey proposes to call the island of Osnaburgh and Matilda, was entered by a channel sufficiently wide and deep for a vessel of the class of the Blossom. The remains of a shipwreck, supposed of the Matilda whaler, lost in 1792, were found on this island. It is fourteen

miles long, with many trees, but no cocoa-nut or other fruit-trees. It has never, apparently, been inhabited, and the birds were consequently so tame as to allow themselves to be lifted from their nests; while fish were taken as easily by sticks and boat-hooks as by lines. Latitude  $21^{\circ} 53' 03''$  S., and longitude  $138^{\circ} 59' 34''$ .

To the south of this island another small island was examined, three miles and three-quarters in length by three in width, its form nearly an oblong, with the southern side much curved. The lagoon in the centre was deep, its boundary very low and narrow, and in places it overflowed. Captain Beechey gave this island the name of Cockburn Island. Latitude  $22^{\circ} 12' 25''$  S., and longitude  $138^{\circ} 39' 53''$  W.

The next island visited was the Lagoon Island of Captain Bligh. This is inhabited; the natives are darker than those of Cook's Lagoon Island,—nearly naked, with their hair tied in a knot on the top of the head, and provided with stones, clubs, and spears. No landing was effected on this island, which is in latitude  $21^{\circ} 37' 41''$  S., and longitude  $140^{\circ} 37' 58''$ , and is larger than as exhibited on Arrowsmith's charts.

Byam Martin Island, discovered by Captain Beechey, is in latitude  $19^{\circ} 40' 22''$  S., and longitude  $140^{\circ} 22' 28''$  W. It is an oval of three miles and three-quarters in diameter, of coral formation, and has a lagoon and productions very similar to the other islands recently described.

Gloucester Island, in latitude  $19^{\circ} 07'$  S., and longitude  $140^{\circ} 37'$  W., was found to differ very materially in its present form and extent from the descriptions given by its discoverer, Captain Wallis. At the south-east angle of the island they noticed a morai built of stones, but there were no inhabitants upon the shore.

In latitude  $18^{\circ} 04'$  S., and longitude  $140^{\circ} 51'$  W., Captain Beechey visited Bow Island, discovered, in 1768, by Bougainville, and seen the following year by Captain Cook, who gave it its present name, from the resemblance which its shape was supposed to have to a bow. It is of coral formation, thirty miles long, and, at an average, five broad, well wooded on the weather side, but scantily on the other, where it is so low that the sea, in places, washes into the lagoon. The Blossom, having navigated with considerable difficulty, and some danger, through a channel in the coral reef, was enabled to anchor in the lagoon. The strip of low land inclosing the lagoon is nearly seventy miles in extent, and the part that is dry is about a quarter of a mile in width. The lagoon is studded with coral knolls. This island is thinly inhabited, the natives not amounting to more than 100 souls. It is remarkable as having been visited for its pearl fishery, and an English brig was there at this time for the purpose, having hired divers from Chain Island. Water was procured in abun-

dance, and of tolerable quality, by digging holes through the sand into the coral rock.

The islands visited between Bow Island (which they quitted on the 20th of February) and Otaheite were all of the same nature and formation as those already described, and furnished no additional information beyond the correct determination of their size and position. Among the number are two which were previously unknown: the largest of these, which was also the most extensive of their discoveries in the archipelago, Captain Beechey named Melville Island; and the other Croker Island; but the narrative contains no details of the appearance of these islands. Those whose position was determined were as follows:—

		Lat. South.	Long. of Greenwich.
	Moller Island . . . .	17° 44'	140° 35'
	Resolution Island . . . .	17 22	141 23
	Cumberland Island . . . .	19 10	141 10
	Prince William Henry Island, } or Lostange . . . . . }	18 49	141 42
Two groups	{ Dawahaidy . . . . .	18 18	142 06
	{ Maracan . . . . .	17 58	142 08
	Doubtful Island . . . . .	17 19	142 22
	Melville Island . . . . .	17 34	142 39
	Bird Island . . . . .	17 48	143 04
	Croker Island . . . . .	17 26	143 23
	Maitea Island . . . . .	17 53	148 00

The discoveries of Cook and Wallis in the track followed by Captain Beechey are relatively correctly placed; but those of the latter are as much as forty miles in error in longitude, and several miles in latitude, which has occasioned two of them to be mistaken for each other by Bellinghausen, and one to be considered as a new discovery by Captain Duperrey; but Captain Beechey considers that there can be no doubt but that this navigator's Lostange Island is the same as Wallis's Prince William Henry's Island.

Of the thirty-two islands visited in succession, only twelve were inhabited, including Pitcairn Island; and the amount of the population altogether, Captain Beechey supposes, cannot possibly exceed 3100 souls, of which 1000 belong to the Gambier Islands, 1260 to Easter Island, leaving 840 persons only to occupy the other thirty.

Captain Beechey thinks that there is a great diversity of features and complexion between the natives inhabiting the volcanic islands and those of the coral formations—the former being a taller and fairer race. This, he remarks, may be referred to a difference of food, habits, and comfort; the former having to seek a daily subsistence upon the reefs, exposed to a burning sun, and

to the painful glare of a white coral beach ; while the others enjoy plentifully the produce of the earth, repose beneath the genial shade of palm or bread-fruit trees, and pass a life of comparative ease and luxury.

In approaching Otaheite, the mountains were seen at the distance of ninety miles, making their height, on a rough computation, to be 7000 feet ; and the island of Maitea was found to be 1432 feet above the sea.

As Captain Beechey wished to prepare his ship and recruit the sailors at Otaheite, previous to his journey northward, he repaired thither after the examination of the archipelago, and anchored, on the 18th of March, in the outer harbour of Seanoa, about four miles westward of Matavai Bay, in Otaheite ; but as the details connected with the stay of the Blossom at these islands do not present us with any facts of immediate interest to geography, we shall not dwell upon this part of the narrative.

On the 26th of April the ship left the island mentioned above, and reached the low island of Tetharoa, in latitude  $17^{\circ} 02' S.$ , and longitude  $149^{\circ} 30' W.$ , the watering-place of the Otaheitans.

On the 20th of May the Blossom came to anchor at Honoruru, the principal port of the Sandwich Islands. On the 1st of June they hauled into Oneehow, the westernmost island of the Sandwich group, in latitude  $21^{\circ} 52' N.$ , and longitude  $160^{\circ} 23' W.$ , where Vancouver anchored. This island is famous for its yams, fruit, and mats.

On leaving this island, Captain Beechey shaped his course for Kamschatka, in doing which he deviated from the tracks of both Cook and Clarke, passing to the eastward of Bird Island, and gaining the latitude of  $27' N.$ , and on the 28th of June anchoring off the town of Petrapaulski, in latitude  $53^{\circ} 00' N.$ , and longitude  $201^{\circ} 16' W.$  On the 1st of July they weighed anchor again, but only succeeded in getting out of the harbour on the 5th. On the 10th, Beering's Island was close upon them. Its latitude was determined to be  $55^{\circ} 22' N.$ , and longitude  $194^{\circ} 00' W.$  On the 17th, they were off St. Lawrence's Island, when they had communication with the natives, who came off in baidars ; and on the 19th of July they saw the island of King, which is described as small, but high and rugged.

Captain Beechey examined the Diomed Islands, which were seen from the mast-head at fifty miles distance, and found them to be three in number, as first advanced by Captain Cook, and since put in doubt by Kotzebue, who mentions a fourth, probably East Cape. Captain Beechey named the eastern one Fairway Rock, latitude  $65^{\circ} 38' N.$ , and longitude  $168^{\circ} 43' W.$  To the centre one he left its original name of Krusenstern, latitude  $65^{\circ} 46' N.$ , and longitude  $168^{\circ} 55' W.$  ; and the north-western is

named Ratmanoff, and is in latitude  $65^{\circ} 51' N.$ , and longitude  $169^{\circ} 63' W.$

After doubling Cape Prince of Wales, they were becalmed in Schismareff inlet. This broad sheet of water extends inland in an E.S.E. direction, and is backed by distant mountains. Saritcheff Island lies immediately before the opening, which is ten miles wide.

From this inlet they sailed northward, the coast being low and swampy, with small lakes inland; and entered Kotzebue Sound on the 22nd of July, naming a deep inlet on its northern shore, which had escaped Kotzebue's observation, Hotham Inlet, afterwards examined by Mr. Elson. As the object of the expedition was now to afford every assistance in their power to their countrymen engaged in exploring the arctic lands and seas, Captain Beechey proceeded directly to Chamisso Island, the point of rendezvous, which they reached on the 25th July, 1826, five days only after the appointed time,—subsequently examining the coast for a considerable distance to the N.E. in the Blossom, and in the ship's barge, which attained a western longitude of  $156^{\circ} 21'$  at Point Barrow. The expedition was unsuccessful in obtaining any information of the proceedings of Captain Sir John Franklin in their first visit to the polar seas, and equally so on their return to the same latitude in the following year. The privations and suffering to which the crew of the ship were exposed during their arduous navigation, reflect the highest credit on their characters as sailors; and a careful and accurate examination of the coast was made under circumstances which demanded great fortitude and perseverance. The results of this examination we shall now point out, beginning at Kotzebue Sound, in which the Blossom was anchored on several different occasions. Cape Espenberg, its north-west extremity, is in latitude  $66^{\circ} 34' N.$ , and longitude  $163^{\circ} 36' W.$  It is a narrow strip of land, on which are some high sand-hills, and a great many poles are placed erect upon it. The sea penetrates to the southward of this cape, but the entrance is closed by a bar which stretches all along the coast, extending to the inlet which Captain Kotzebue meditated to explore in baidars, and was very sanguine that it would lead to some great inland discovery. The extreme shallowness of the water prevented the examination of this inlet by the gig of the Blossom. The whole of the coast here is swampy, low, and intersected by lakes and rivers. The rounded hills which bound the horizon of the sound to the northward branch off inland at this point; and a distant range, of a totally different character, rises over the vast plain that extends to Cape Espenberg, and forms the whole of the western side of Kotzebue Sound. The land on the south side of the Bay of Good Hope is higher, more rocky, and of a bolder

character than the opposite shore, though it still resembles it in its swampy covering, and in the occurrence of lakes wherever the land is flat. Cape Deceit, so named by Kotzebue, is a bold promontory with a conspicuous rock off it. It appears to be composed of compact limestone, in large angular blocks. To the east of Cape Deceit are two bays, each with a river, having bars across their entrances. The first promontory eastward appears to be composed of limestone: on the second they met with slaty limestone, talcaceous slate, and alum slate. The extent of Spafareif bay is about three miles, when it separates into a number of small branches communicating with several lakes. The coast of this part of the sound was found covered with a deep swampy moss. A range of hills extends eastward to Escholtz Bay, which terminates in a river about a mile and a half in width, and broken, at the time it was visited, into narrow and intricate channels by banks,—some dry, and others only partly so. The shore around is flat, broken by several lakes, with cliffs principally formed of diluvial clay; and Captain Beechey has satisfactorily shown, that the bones which the naturalists of Kotzebue's expedition believed to have been incased in ice, were embedded in this clay. From Elephant Point westward to the neck of Choris Peninsula, the shore is difficult of access on account of long muddy flats extending into the bay, and, in some places, dry at low water, a quarter of a mile from the beach. The land about this part of the sound is generally characterised by rounded hills, from about six hundred to a thousand feet above the sea, with small lakes and rivers. Its surface is rent into deep furrows, which, until a very late period in the summer, are filled with water, and being covered with a thick swampy moss, or with long grass or bushes, it is extremely tedious to traverse it on foot. Chamisso Island, the highest part of which is 231 feet above the sea, is steep, except to the eastward, where it ends in a low sandy point, upon which are the remains of some Esquimaux habitations. It has the same swampy covering as the land before described, from which, until late in the summer, several streams descend, and are very convenient for procuring water. Detached from Chamisso there is a steep rock, which was named Puffin Island, from the quantity of those birds which built upon its projecting crags. It is composed of mouldering granite, which has broken away in such a manner that the remaining part assumes the form of a tower.

North of Chamisso Island is Hotham Inlet. It is of considerable width, and extends thirty or forty miles in a broad sheet of water, which, at some distance up, was fresh. The entrance of this inlet was so shallow that the barge could not enter. There is a shoal off the entrance, and in the middle of the channel there were only

five feet water at half flood. The shoal extends eight miles off the land, and is very dangerous, as the soundings give very short warning of its proximity. Cape Krusenstern is a low tongue of land, intersected by lakes, lying at the foot of a high cluster of hills, not in any way remarkable. The coast here takes an abrupt turn to the northward, and the current sets strong against the bend. To the north, plains extend from the hills to the sea, composed of elastic bog earth, intersected by small streams, on the edges of which the buttercup, poppy, blue bell, pedicularis, vaccinium, saxifrage, and some cruciform plants, thrive well. In other parts, however, the vegetation was stunted, and consisted only of lichens and mosses. Cape Mulgrave of Captain Cook is a range of hills, which terminate in a plain intersected by lakes near the beach, and probably not observed by that navigator. The next cape northward was named Cape Thomson. It is a bold promontory, 450 feet in height, and marked with differently coloured strata. A cape close to this has been named Cape Ricord, by the Russians. Low land was observed stretching out from Cape Thomson to the W.N.W. as far as the eye could reach: Captain Beechey named it Point Hope. The farthest land in sight to the northward answered to Cape Lisburn of Captain Cook. The mountain above the cape attained a height of 850 feet above the sea. The basis of this mountain was limestone, with beds of flinty slate. There was little soil in the valley, and the stones were covered with a thick swampy moss. The land here turns to the eastward towards a cape, which was named Beaufort. The land northward was low and swampy, covered with moss and long grass. Cape Beaufort is situated in the depth of a great bay, formed between Cape Lisburn and Icy Cape, and is the last point where the hills come close down to the sea, by reason of the coast line curving to the northward, while the range of hills continues its former direction.

The Cape is composed of sandstone traversed by narrow seams of coal, and from these sandstone hills there is an uniform ascent to the rugged mountains of limestone and flint at Cape Lisburn; the range is, however, broken by extensive valleys, intersected by lakes and rivers. Icy Cape, the farthest point reached by Cook, is very low, and has a large lake at the back of it, which receives the water of a considerable river, and communicates with the sea through a narrow channel much encumbered with shoals. The main land on both sides of Icy Cape, from Wainright Inlet on one side to Cape Beaufort on the other, is flat and covered with swampy moss. It presents a line of low mud cliffs, between which and a shingly beach that everywhere forms the coast line, there is a succession of narrow lakes capable of being navigated by baidars or small boats. The farthest tongue of land which Mr.

Elson reached in the Blossom's barge was named Point Barrow.— It lies 126 miles to the north-east of Icy Cape, and is only 146 miles from the extreme of Captain Franklin's discoveries, in his progress westward from the Mackenzie River. The bay, which appeared to be formed to the eastward of this point, was named Elson's Bay. To the nearest conspicuous object to the southward of Point Barrow Captain Beechey gave the name of Smyth; and other points and inlets to the southward are also named. A chain of sandy islands, lying some distance from the mainland off Cape Franklin, were called Sea-horse Island; and beyond, a bay, formed by the junction of this chain of islands with the mainland, was called Peard Bay. The land from Cape Smyth, which was about forty-five feet in height, slopes gradually down to Barrow Point, which is very low. Thus, by the expedition of the Blossom's barge, about seventy miles have been added to the geography of the polar regions; and the distance between Captain Franklin's discoveries and those of the Blossom has been brought within so small a compass as to leave very little room for further speculation on the northern limits of the continent of America. The actual distance left unexplored is reduced to 146 miles; and there is much reason, Captain Beechey says, to believe, from the state of the sea about Point Barrow, and along that part of the coast which was explored by Captain Franklin, that the navigation of the remaining portion of unknown coast, in boats, is by no means a hopeless project.

In his voyage in the ensuing year in these seas, and on his return to the southward, Captain Beechey discovered Port Clarence and Grantley Harbour. To the southward of Cape Prince of Wales, the coast trends to the east and assumes a totally different character to that which leads to Schismareff Inlet, being bounded by steep rocky cliffs and broken by deep valleys, while the other is low and swampy ground. To a bold promontory, which advances into the sea beyond this, the name of York was given; to the eastward of which is a low spot of land projecting about ten miles from the coast, forming a right angle, and having a channel about two miles wide between its extremity and the northern shore, which is the entrance to Port Clarence. At the north-east angle of this harbour is an opening leading into Grantley harbour, which is ten miles in length by two and a quarter in width, with an almost uniform depth of two and a half and three fathoms water, beyond which there is a strait, in all probability, communicating with a large inland lake. To the points at the entrance of Port Clarence, Captain Beechey gave the names of Spencer and Jackson.

Captain Beechey weighed anchor from Kotzebue Sound on the 13th of October, 1826; and, passing Cape Krusenstern, and



successively King Island and the group of St. Paul's, sailed through the strait westward of Oonemak, which is nine miles and a half across. On the 5th of November he made the high land of New Albion, passed the promontory of Punta de los Reyes, and, on the 8th, arrived at San Francisco. Previous to the departure of the Blossom for Monterey, a land expedition, consisting of Messrs. Collie, Marsh, and Evans, was made to that port, which was very productive to the collections of natural history.

The Blossom left Monterey for the Sandwich Islands on the 5th of January, 1827, and on the passage searched unsuccessfully for those islands that were marked near the route, rounding-to every night when near the position of any one, that it might not be passed unobserved, and making sail on a parallel of latitude during the day. In this manner Henderson's and Cooper's Islands were sought for, besides several others said to lie near them, and also a group in the latitude of  $16^{\circ}$  N., and longitude between  $130^{\circ}$  and  $133^{\circ}$  W.; but nothing was seen even there of them, nor any of the usual indications of land; so that if these islands exist, they must be in some other parallel than that assigned to them in the American 'Geographical Table' for 1825.

On the 26th of January the Blossom anchored in the harbour of Honoruru; and, after a stay of thirty-nine days, put to sea again. On the 25th of March the island of Assumption was passed. Arrowsmith has incorrectly placed the Mangs on the south side of Assumption, as, by the astronomical bearings of the Blossom, they are situated N.  $27^{\circ} 7' 30''$  W. (true) from the south-east end of that island, and are in latitude  $19^{\circ} 57' 02''$  N. They consist of three high rocks, lying in a south-easterly direction. Captain Beechey did not observe the rocks discovered by Freycinet in latitude  $19^{\circ} 32'$  N., and which he supposed to be the Mangs: if both latitudes are correct, he must have passed within four miles of them.

A contrary wind, which rendered it necessary to beat through the channel between the Bashee Islands and Botel Tabago Xima, afforded an opportunity of connecting these islands trigonometrically, and of obtaining transit bearings when in intermediate stations between them; and from these observations, compared with the chart of Captain Horsburgh, the latter appeared to be constructed with great care and accuracy.

Captain Beechey was anxious, on leaving Macao, where he arrived on the 10th of April, to explore the sea to the eastward of Loo Choo. He was, however, prevented doing so by variable winds and contrary currents, and was obliged to steer directly to the latter place.

During his stay at Loo Choo, Captain Beechey completed the survey of the port of the town of Nepa, or Papa Ching, which

he does not consider to be the capital of Loo Choo, but rather a town situated upon a hill, and surrounded by a wall, called by the natives Shui, or Shoodi : its extent could not, however, be ascertained, from the dense foliage by which it was surrounded. The officers of the Blossom made several excursions into the interior, visiting the public cemeteries, a temple of Budh, and some cotton manufactories. Captain Beechey mentions sweet potatoes, millet, wheat, Indian corn, rice, potatoes, cabbages, barley, sugar-cane, pease, tea-shrubs, taro, tobacco, capsicums, cucumbers, cocoa-nuts, carrots, lettuces, onions, plantains, pomegranates, and oranges, as growing on Loo Choo. The narrative contains some interesting details upon the natives, which make us feel grieved that the expedition was not prepared with linguists, to clear up some doubtful points in the history and character of this singular people.

The Blossom sailed from Loo Choo on the 25th of May, 1827; and on the 6th June passed upon the spot where the island of Disappointment is placed in the latest charts, without seeing land.

On the 8th they reached the Bonin Islands, which are all small, but remarkable. The central island was named Kater, and the largest in the cluster Peel. This island has a good port, to which Captain Beechey gave the name of Port Lloyd. In this island, almost every valley has a stream of water; and the mountains are clothed with trees, among which the *Areca oleracea* and fan-palms were conspicuous. There are several sandy bays, in which green turtle are sometimes so numerous that they hide the colour of the shore. The sea yields an abundance of fish: sharks also abound, and are very voracious. These islands are subject to earthquakes, and have every appearance of being of volcanic origin. A large bay at the north-east angle of Peel Island was named Fitton Bay. Captain Beechey controverts the propriety of the name of Bonin-Sima being given to these islands, which do not agree with the account given of them by Abel Remusat and Klaproth, taken from Japanese documents, but correspond more nearly with the *Yslas del Arzobispo*, described many years ago in the '*Navigacion Especulativa y Pratica*,' published at Manilla. Kämpfer's description of the islands of Bonin-Sima may, however, be safely referred to the Archbishop's Isles. The group consists of three clusters of islands, lying nearly N. by E., and extending from the latitude of  $27^{\circ} 44' 35''$  to  $26^{\circ} 30' N.$ , beyond which was the utmost limit of their view to the southward. The northern cluster was named Parry Islands. The middle cluster consists of three, of which Peel's Island is the largest. This group is nine miles and a quarter in length, and is divided by two channels, so narrow, that they can only be seen when abreast of them, and are not navigable by shipping. The northern island

was named Stapleton, and the centre Buckland. At the south-west angle is a bay, with good anchorage, which was called Walker's Bay. The southern cluster visited by Mr. Coffin in 1823, in a whaler, was named Baily Islands.

Captain Beechey, having now spent so much time in low latitudes, was obliged again to steer to the inhospitable seas of the North; but as we have already embodied the results of this second journey, we shall not dwell upon the difficulties and dangers with which this navigation was attended. In the month of October, 1827, he was on his return; and on the 29th anchored at Monterey. He remained at this harbour until the 17th of November, and then sailed for San Francisco. The Blossom afterwards put into San Blas and Mazatlem, taking the opportunity of examining the Tres Marias and Isabella Islands, an account of which is inserted in the nautical remarks. On the 29th of March, 1828, after several delays, they crossed the equator in  $99^{\circ} 40' W.$ , and arrived at Valparaiso on the 29th of April. On the 23d of May they arrived at Coquimbo, from which port they finally put to sea on their way to Brazil, passed the meridian of Cape Horn on the 30th of June, and arrived at Rio Janeiro on the 21st of July. After a passage of forty-nine days they arrived at Spithead; and, on the 12th of October, the ship was paid off at Woolwich.

**HYDROGRAPHY.**—That part of Hydrography which would more particularly come under the observation of a nautical expedition, would be the natural history of the sea; and we may perhaps notice the observations made on the direction and intensity of currents as the most interesting of this class. In the passage from Teneriffe to Rio Janeiro, from June to July, it appears that the N.E. trades propelled the waters, in a S.W. by W. direction, at the average rate (and it is to be remarked, that all the rates given are averages) of eleven and a half miles per diem; and the S.E. trades to the W.N.W. with double the velocity, or twenty-two and a half miles per day; and that in the intermediate space, where light variable winds prevailed, a strong current was observed, running in a contrary direction to both these, at the rate of thirteen miles per day. Humboldt, Sir Erasmus Gower, and others who have given the rate of the current in the Atlantic between the tropics, have limited its motion to eight and ten miles a day. It was Captain Beechey's intention to have given a table of currents in the Appendix, but this was omitted for want of space. In the South Pacific Ocean, about the parallel of  $27^{\circ}$ , the currents averaged nine miles a day; and nearer the equator, *i. e.* from  $18^{\circ} S.$  to  $4^{\circ} N.$ , including the meridian of Otaheite  $16^{\circ}$ , five miles per day. Nearer the coast of South America, between the parallels of  $8^{\circ} N.$  and  $19^{\circ} S.$ , about the meridian of  $103^{\circ} W.$ , it was further increased to twenty-eight miles a day.

In both oceans there appears to be, on the whole, a north-easterly current between the trade winds. In the Atlantic it was found to average thirteen miles a day; and in the Pacific, twenty-three miles a day. In the vicinity of the Gallapagos, however, there is an exception to this remark, as the current there appears always to run to the westward, and with considerable rapidity.

The rates of the currents in both oceans are materially different in different meridians: those in the Atlantic increasing with westerly longitudes, and those in the Pacific, on the contrary, decreasing—the former attaining its maximum near the Gulf of Mexico, the latter near the Gallapagos. They are also affected by the westerly monsoons.

Questions connected with the saltness of the ocean, which may be obtained by its specific gravity, are also of much hydrographical interest. It has been supposed, that with the exception of certain gulfs, into which large fresh-water rivers emptied themselves, the saltness of the ocean diminishes towards the poles; but the experiments of Bladh, reduced by Kirwan to the temperature of  $16^{\circ}$ , do not justify this opinion, which is further not supported by the researches of De Humboldt. Captain Beechey has appended a table of experiments to his narrative, in which the specific gravity of the surface of the sea, reduced to the temperature of  $60^{\circ}$ , and corrected for the error of the hydrometer, is given for every second degree of latitude. From these tables, it would appear that the specific gravity is at its maximum between the tropics,—that it increases to about  $40^{\circ}$  N. lat.,—and then again diminishes. In the South Atlantic, the specific gravity of the seawater was also found to be less in the highest latitudes; and the same results were obtained from the observations of 1825 and 1828. In the Pacific Ocean, where the experiments ranged from the equator to  $71^{\circ}$  N. latitude, and from the equator to  $88^{\circ}$  S. latitude, the results are still more striking; and accord remarkably with those obtained by Drs. Marcet and Trail, and Captains Scoresby and Ross. No experiments are recorded on the comparative saltness of the surface and the deep water.

**METEOROLOGY.**—The meteorological researches are confined to observations on the aurora borealis, and on the pressure, temperature, and humidity of the atmosphere. The expedition had frequent opportunities of observing the aurora borealis in the autumns of 1826 and of 1827. From the 25th of August, on which day it is remarkable that in both years it made its first appearance, until the 9th of October, about the time of the departure of the Blossom from the northern regions, in both years this beautiful meteor was visible every night that was clear, or when the clouds were thin and elevated: it never appeared in wet weather. In 1826, when the weather was settled,

the aurora generally began in the W.N.W. and passed over to the N.E. until a certain period, after which it as regularly commenced in the N.E. and passed to the N.W.; whilst in 1827 the appearances of the meteor were as uncertain as the season was boisterous and changeable. The period when this change in the course of the light took place coincided very nearly with that of the equinox. The meteor was uniform in making its appearance always in the northern hemisphere, and generally in the form of elliptical arches from  $3^{\circ}$  to  $7^{\circ}$  of altitude, nearly parallel with the magnetic equator. The arches, when formed, in general remained nearly stationary, and gave out coruscations, which streamed towards the zenith. These observations agree with those of Mr. Dalton, who always found a similar coincidence when the arches were complete. The light was decidedly seen between a fleecy, cloud-like substance and the earth. The proofs of this meteor belonging to the regions of our atmosphere were strengthened by different appearances of the meteor, and may be considered as completely established by the observations of Captains Franklin and Parry. The aurora was never attended by any noise, nor was any disturbance of the needle observed. It must be remarked, that Kater's compass was the only instrument observed, and then on board the ship only. Mr. Collie, the surgeon of the Blossom, has advanced an ingenious hypothesis on the nature of the aurora. It is probable that the new discoveries which are daily enriching science in electro-magnetism will remove many of the doubts which prevail on the nature and origin of this interesting meteor.

The Barometrical observations include researches on the horary oscillations, and on the mean altitude of the column of mercury at different parallels. The instrument used was an iron cistern marine barometer, of Jones's make: neutral point, 30.102; capacity,  $\frac{1}{24}$ ; temperature, 52. It was suspended in Captain Beechey's fore cabin, and, with the exception of the first five months, registered every three hours. The diurnal variations are thus also contained in these researches. It has been supposed, that while the irregular oscillations appear almost null at the equator, and increase in extent towards the poles, the regular oscillations would appear to follow a contrary law, and diminish in extent towards the poles. The extent of the vibration of the column of mercury between the tropics was observed by Captain Beechey to be, in the North Atlantic, .038; in the South Atlantic, or between the equator and the tropic of Capricorn, to be .067; and the amount of the horary oscillations between both tropics was, for 3 A.M. — 026, for 9 A.M. + 019, noon + 011, 3 P.M. — 030, 9 P.M. + 014, and for midnight + 011. The mean vibration or extent from maximum to minimum, between the tropics, was, for the North Pacific, .059, and for the South Pacific,

.027 ; and the mean periodical oscillation for 3 A.M. — 015, 6 A.M. — 005, 9 A.M. + 006, noon + 005, 3 P.M. — 025, 6 P.M. — 004, 9 P.M. + 018, and for midnight, + 015. It is hardly necessary to dwell upon the dates given for the mean altitude of the barometer in different latitudes : as compared with one another the results are useful ; but the true height of the column of mercury in any given place can only be obtained from the annual mean, which at the level of the sea and at the same temperature is every where pretty nearly the same. The highest range of the barometer in the polar regions observed by Captain Sir E. Parry was 30.86, which it attained in Melville Island, on the 27th of April, 1820 ; and Captain Beechey observed the barometer at 30.32 in Kotzebue Sound, on September 1st, 1826.

The tables of the observed temperature and humidity of the air in different parallels, and which have been used in the correction of errors, are minute, and extremely useful for reference.

The practical application of observations on the temperature of the sea have, as far as we know, been only twofold. The celebrated Franklin first fixed the attention of natural philosophers on the phenomena which are presented in the temperature of the ocean above shallows, and his remarks have since been verified by De Humboldt. Captain Beechey mentions in his narrative some remarkable cases where changes in the temperature of the surface of the sea were forerunners of shifts of wind, which he thinks they preceded, even before any change in the temperature of the air. The observations on the temperature of the surface of the sea in the Appendix of Captain Beechey's work were made every four hours, by plunging a thermometer into a bucket of sea water immediately it was drawn up, and they are compared with the mean of bi-horal observations on the temperature of the air. The mean only of the daily observations being given, we cannot ascertain how far they verify Péron's notions on the variations between mid-day and midnight, and the relation of these to the temperature of the ambient air at the same period ; but the observations on the temperature of the surface of the sea, compared with that of the atmosphere, appear to demonstrate that in the same situation the former is greater than the latter, and, consequently, that the law in hydrography is correct, which establishes that the mean term of the temperature of the waters of the ocean at their surface, and far from the continents, is greater than that of the atmosphere with which the waters are in contact. This is more particularly true with regard to the equatorial and inter-tropical regions, as also to seas distant from land, for exceptions were met with in Kotzebue Sound and in other places. Observations on the temperature of the sea at different depths are perhaps of still greater interest, both on account of the difficulty attendant on experiments of that

character, of the discussions which are yet involved in the results of former experiments, and of the light which they assist in throwing on the temperature of the globe and the theory of the earth. The observations made during the expedition of the *Blossom* were with self-registering thermometers, at various depths, from 50 to more than 700 fathoms; and in all cases it appears that the temperature diminishes with the depth to a certain distance, when it begins to increase again, or at least remains stationary; and this depth appears to vary from 300 to 500 fathoms. The experiments at depths beyond this were too few to allow of any satisfactory results; but it appears, as in the experiments of the Russian expedition recorded by Lentz, that below 400 fathoms the temperature was nearly stationary. The difference of temperature between the surface and a depth of 700 fathoms, as observed by Captain Wauchope, in *H.M.S. Euryene*, amounted to  $31^{\circ}$ . There are several experiments made by Captain Beechey, in which the difference amounted to  $35^{\circ}$ ,  $36^{\circ}$ , and  $37^{\circ}$ , and in one case to  $39^{\circ}.5$ : this was at a depth of 400 fathoms. At 784 fathoms in the North Pacific, the difference was  $36^{\circ}.8$ ; and in the same place, at 600 fathoms,  $37^{\circ}$ ; at 760 fathoms, the difference was  $35^{\circ}.5$ ; and in the same place, at 575 fathoms,  $35^{\circ}$ . In the South Atlantic, at a depth of 854 fathoms, the difference was only  $10^{\circ}.4$ .

**MAGNETISM.**—The observations on terrestrial magnetism were on the dip of the magnetic needle, on the intensity of the magnetic force, and on the variation of the compass with Barlow's plate attached. The dips were observed with the same instrument which had been used at Melville Island: it had two common needles, and another with a moveable weight, fitted up on Professor Mayer's principle. No. 1 was used solely for observations on the magnetic intensity, and its poles consequently were never reversed; while No. 2 and Mayer's were employed for dips, and had their poles changed at each observation. The horizontal needle was suspended in a stirrup by a fine silk, in an octagon wooden box, furnished with a graduated wooden circle on the inside, and covered with a glass top, in which there was fitted a contrivance for moving the needle out of the magnetic meridian. Until the arrival of the ship at Woahoo, the stay at each place was too short, and Captain Beechey's time was too much occupied with astronomical observations, and with the business of surveys, for him to give the necessary attention to these delicate observations; but after that period the observations were regularly made. Unfortunately for the completion of the series upon the magnetic intensity, the needles used for that purpose became corroded upon the passage from Loo Choo to Petropaulski, by which their magnetic power was much diminished; and as the amount of the change could not be ascertained,

Captain Beechey thought it advisable not to introduce the observations into the published tables. The following table will present the result of the observations on dips :—

	Lat. N.	Long. W.	Mean dip N.
1826 N.W. America .	70° 31'	160° 30'	81° 63'
Chamisso Island .	66 12	161 46	77 39
England .	Egham		69 58
Petropaulski .	53 01	201 15	64 02.3
San Francisco .	37 48	122 24	62 35.2
Macao .	22 12	246 28	29 57.5
Woahoo .	21 18	158 00	40 33
Loo Choo .	26 12	232 18	35 01.7
Acapulco .	16 50	99 51	38 58

The observations on the horizontal needle confirm the generally received law, that the intensity of the magnetic force increases as we proceed from the equator to the poles, though the ratio of that increase, as resulting from former experiments, is rather greater than is indicated by the experiments of Captain Beechey. The intensity of the magnetic force, which is in proportion to the square of the number of vibrations made in a given time, is also added to the table of observations, both in its observed and computed ratios.

The observations on the variation of the compass were made with Barlow's plate attached; the local deviation of the needle was ascertained by swinging the ship at Spithead, and the position of the plate determined by the directions which accompanied it. In 1827, it became necessary to alter the position of the plate a little, on account of a different distribution of the iron in the ship. This was done pursuant to experiments made at Petropaulski. These observations, exceedingly minute and numerous, are of the greatest interest to terrestrial magnetism, and compared with Professor Hansteen's chart of the variations and dip of the needle, furnish additional proof of the accuracy which this branch of science is now attaining. A table is appended, containing the variation of the compass from observations made on shore at different parts of the globe, principally with two of Kater's compasses, the errors of which were 8° 58' and 2° 18' respectively.

PHYSICAL GEOGRAPHY.—Physical Geography, in addition to the history of the mountains, plains, and valleys, or the contrasted configurations of the earth's surface, embraces Geographical Zoology and Geographical Botany; but as the natural history of this voyage is to be published in separate volumes, and as the geographical distribution of the plants or animals can only be connected with an accurate knowledge of the species met with in different places, we must defer any detailed account of these results until the materials furnished by the scientific labours of the



naturalists and officers attached to the expedition are placed at our disposal.

There are, however, some points of importance to Physical Geography noticed in the narrative, which it would be improper to pass over. We allude more particularly to the information given of the character and formation of the coral islands which are scattered over the great Southern Pacific Ocean, and which appear to be daily forming new abodes for the roving tribes of those archipelagoes. The observations of Captain Beechey on this subject, illustrated by excellent engravings and diagrams, are of great interest. We shall first briefly notice these observations, and then consider the general views which result from them.

Forster and other naturalists have imagined that the polypi of the corals build upwards to a certain height, raising their habitation within a little of the surface of the sea, which gradually throws shells, weeds, sand, small bits of coral, and other things, on the tops of these coral rocks, at last fairly raising them out of the water; but Captain Beechey makes the important observation, that it is the abrupt descent of the external margin which causes the sea to break upon it, and prevents these strips being inundated, and the loose sands, divested of any loose materials, heaped upon them, are rarely elevated more than two feet above the level of the sea.

Those parts of the strip which are beyond the reach of the waves are no longer inhabited by the animals that reared them, but have their cells filled with hard, calcareous matter, and present a brown, rugged appearance. The width of the plain, or strips of dead coral, which came under Captain Beechey's observation, in no instance exceeded half a mile, from the usual wash of the sea to the edge of the lagoon, and in general were only about three or four hundred yards. Beyond these limits, on the lagoon side in particular, where the coral was less mutilated by the waves, there was frequently a ledge two or three feet under water at high tides, and thirty to forty yards in width; after which the sides of the island descended rapidly, apparently by a succession of inclined ledges, formed by numerous columns united at their capitals with spaces between them, in which the sounding lead descended several fathoms. The islands slope on both sides by an almost imperceptible inclination to the first ledge. The entrances to the lagoons generally occur on the leeward side, though they are sometimes situated on a side that runs in the direction of the wind, as at Bow Island. All the points or angles of these islands descend into the sea with less abruptness than the sides, and with more regularity. The wedge-shaped spaces that the meeting of the two sides would form in the lagoon is filled up by the ledges being broader there. In such places, as well as in the narrow part of the lake, the polypi are in greater numbers: they appear

to rise to the surface in the form of a truncated cone, and then their progress being stopped, they work laterally : so that if several of them were near each other, they would unite, and form a shelf similar to that which exists round the margin of some of the lagoons. Some of the lagoons which the Blossom entered were from twenty to thirty-eight fathoms in depth. A fact, however, in contradiction to Captain Beechey's opinion, has been previously mentioned by Chamisso ; nor were there wanting surmises of what perhaps this navigator has the credit of proving satisfactorily—that the wall of coral which encircles these islands is so narrow and perfect, that they have been improperly designated as groups or chains of islands, in consequence of the wall being broken by channels into the lagoon ; for, on examination, the chain is found continuous under water, and as in all probability it will in time reach the surface, and become dry, the whole of the group may generally be considered as one island.

We may remark that the observations of Captain Beechey, while they correspond with those of the French naturalists in many points, do not favour the hypothesis of former navigators, that the saxigenous polypi raise their habitations gradually from a small base, always spreading more in proportion as the structure grows higher : an hypothesis which is objectionable on many grounds.

There can now be no doubt, from the situation of these coral islands with respect to each other, as they often form rows, their union in several places in large groups, and their total absence in other parts of the same seas, that the polypi have founded their buildings on shoals of the sea, or on the tops of mountains lying under water ; but it is quite incorrect to suppose, with Messrs. Quoy and Gaimard, that there are no islands of any extent constantly inhabited by man, which are entirely formed of corals,—or, that, far from raising from the depths of the ocean perpendicular walls, these animals form only layers or crusts of a few fathoms thickness. And it is equally impossible to grant to all these animalcules one common impulse, or, as Captain Flinders has it, an instinctive foresight to shelter their habitations from the impetuosity of the winds, by forming constantly high walls and reefs to the windward : a circumstance the explanation of which we think might easily be sought in physical causes alone. For if the lateral movements of the polypi, or their natural tendency to horizontal construction, happens to be impeded in any one direction, they will gain vertically what they lose horizontally ; and the resistance being equal on the same side, the true horizontal extent will be everywhere the same, and a wall will be formed : while, in an opposite direction, the same circumstances not being in existence, the constructions of the polypi will extend horizontally as well as vertically, and consequently will not rise with the same degree of rapidity as those which are erected to the windward ; and hence would result

an appearance as if this windward bulwark had really been erected by the 'instinctive foresight' of the animalculæ. If the opinion we have thus hazarded be correct, it is evident that in different situations there will be coral rocks, exhibiting very different characters; and thus, from the charts given of the coral islands which lie in the Indian and Chinese seas, in the regions of the six months' monsoons, it may be inferred that every side is equally advanced in formation. Chamisso says, that the larger species of coral insects, which form blocks measuring several fathoms in thickness, seem to prefer the violent surf on the external edge of the reef; which, with the obstacles opposed to the continuation of their life in the middle of a broad reef, by the amassing of shells and fragments of coral, easily account for the outer edge of the reef first approaching the surface; and the same circumstances must also contribute to the circular character of these reefs, or groups of reefs. Whether those islands, which have greater length than breadth, are opposed in their greatest extent to the winds and waves, appears to depend on the size and arrangement of their submarine supports. The arguments of Quoy and Gaimard, who say that the species which form the most considerable banks, such as the *Meandrinæ*, certain *Caryophyllæ*, and especially the *Astreæ*, require the influence of light to perfect them, and consequently cannot be developed at a depth of from ten to twelve hundred feet, are only applicable to those species; and if the species of the genus *Astrea* are alone capable of covering immense extents of surface, and do not commence their operations at a greater depth than twenty-five or thirty feet, why may not the branched madrepores, which do live at considerable depths, have formed the platform for their reception, just as we see the marine algæ distributed in different zones or depths of the sea\*?

In the uncultivated tracts of our latitude, vegetation generally commences by the appearance of pulverulent lichens, which are succeeded by foliaceous plants of a more perfect organization, by mosses, and finally, varying with the soil and situation, by monocotyledonous or dicotyledonous plants, which gradually make their appearance; but the coral islands of the Pacific, not adapted to support plants requiring a depth of soil, often first afford a basis to high trees provided with fibrous roots, as the *Pisonia*, *Cordia Sebastiana*, *Morinda citrifolia*, and *Pandanus odoratissimus*, which, at a distance, give to these small islands the form of a hill. The loose dry stones of the first ridge are penetrated by the hard roots of the *Tifano*, which expands its branches into a tall, spreading tree, and is attended by the fragrant *Suriana*, and the sweet-scented *Tournefortia*, in the shelter of whose foliage the *Achyranthus* and *Lepidium* seem to thrive the best. Beyond the first

\* Captain Beechey informed Mr. Lyell, that in Ducies Island, W. Long. 120°, he ascertained that the corals were growing at the depth of one hundred and eighty feet. —Lyell's Geology, p. 130.

high and stony ridge, the hardy *Scævola* extends its creeping roots and procumbent verdure towards the sea, throwing its succulent leaves round the sharp coral stones. The gradual developement of vegetation, and succession of species and families, on these virgin islands, would form a subject for investigation of very considerable interest.

It is well known that Bory St. Vincent attempted a classification or geographical distribution of seas, founded upon their natural productions and natural phenomena. A system of this kind, when applied to mediterranean waters, assumed a still greater interest from the new light which it threw upon the changes which animal and vegetable forms undergo, from changes in the physical characters of the medium in which they live, and which promised to open a new field for speculation to geologists. In the wide ocean, however, where the marine productions were few, and those sometimes not well characterized, it was necessary to have recourse to the geographical distribution of the birds and animals that frequented its waters and coasts, as the vegetation of mediterranean shores lent its evidence in tracing affinity or dissimilarity between seas separated by slight geographical distances. In the narrative of Captain Beechey's voyage we find many facts of interest in a study of this kind, the most remarkable of which we shall briefly enumerate. As the Blossom approached the Falkland Islands from Rio Janeiro, some penguins were seen upon the water in latitude  $47^{\circ}$  S., at a distance of 340 miles from the nearest land,—a fact which either proves the common opinion, that this species never strays far from land, to be an error, or that some unknown land exists in the vicinity. Off the river Plate, they fell in with the dusky albatross (*Diomedea fuliginosa*), which on reaching the latitude of  $51^{\circ}$  S. quitted them; but on rounding the Cape, and regaining the same parallel of  $51^{\circ}$  S. on the opposite side, the same bird again came round, and accompanied the ship up the Chili coast. The pintados were their constant attendants the whole way. In the Bay of Conception, shags were observed sometimes to fly in an unbroken line of two miles and more in length. The pintados deserted the ship the day after they had left the coast of Chili. In the lagoons of the coral reefs, abundance of beautifully coloured fish, of the genera *Chaetodon*, *Sparus* and *Gymnothorax*, were observed. Echini were not abundant, but *Aphroditæ*, *Halothuriæ*, *Asteriæ*, &c.

The shell-fish belonged to our own genera. *Helix*, (?) *arca*, *ostrea*, *cardium*, *turbo*, *venus*, *cyprea*, *voluta*, *harpa*, *haliotis*, *patella*, are among those enumerated.

In this dangerous Archipelago birds are seldom fallacious indicators of land. They range about forty miles from the islands, and consist principally of black and white tern. To the W.N.W.

of Sandwich Islands, they first observed the albatross. Captain King, on his passage to Kamtschatka, first met these birds within twenty miles of the same spot. In the same latitudes, the species of flying fish was changed. In  $33^{\circ}$  N. the first birds of the northern regions were met with. These were the *Procellaria puffinus*. The tropical birds accompanied them as far as  $36^{\circ}$  N. In  $35^{\circ}$  N. the sea became covered with beroes, nereis, and other molluscos animals, and small crustacea. Captain Beechey says that the vicinity of the St. Lawrence Islands, in Beering's Straits, is always indicated by the crested auk (*Alca cristatella*). The dredge off this island furnished specimens of genera which exist in great abundance on our coasts. The same remark is applicable to the vegetation of the shores of Beering's Straits and Kotzebue's Sound, and this is nowhere more remarkable than in Cape Espenberg.

We notice these few facts, furnished by Captain Beechey's voyage, not to prove that the respective position of any place on the globe has any exact and positive relation with its aquatic or terrestrial productions. But although these do not stop at such or such an arch of the sphere, and we cannot perhaps quote a single animal or vegetable which first makes its appearance at such or such a degree of latitude or longitude; yet all natural productions have their zones more or less large and sinuous; and with the progress of science, we shall find the manner in which the principal marine and littoral productions are distributed over the immensity of the waters will enable us to obtain grounds for the most natural divisions of their surface.

The altitudes obtained by barometrical or trigonometrical observations attach themselves peculiarly to physical geography, as illustrating the height of continents, of mountain chains, and of culminating points, which, however, are more often objects of curiosity than of scientific interest. The barometrical measurements were computed according to Mr. Daniell's method; and the heights ascertained at sea were with sextants, patent log-bases, and astronomical bearings.

Rio de Janeiro ..	Corcovado .....	2308	Barometer .	1825
"	" .....	2296	Ditto .....	1828
"	" .....	2306	Trig. m. ..	1825
"	" .....	2306	Ditto .....	1828
"	Sugar-loaf .....	1285	Ditto .....	1825
"	" .....	1299	Ditto .....	1828
Conception. ....	N. Pap. Bio Bio ....	789.6	Ditto	
"	Observatory .....	78	Dip of the sea.	
Pitcairn Island ..	Peak on it .....	1046.5	Trig. m.	
Gambier Island ..	{ Highest Peak of Mt. }	1247.9	Ditto.	
"	{ Duff. .... }			
"	Ship Rock .....	441.1	Ditto.	

Miatea .....	Peak on it .....	1432.3	Trig. m.
Beerling's Strait..	Cape Lisburn .....	849	Dip of the sea.
Kotzebue Sound..	Chamisso Island....	231	Ditto.
"	{Hill N. of Spafarief Bay.....}	616	Ditto.
Society Islands ..	{Peak with a hole (Eimeo) .....	404.1	Trig. m.
San Francisco ...	Angel Island.....	900.7	Barometer.
"	Deviation (Balbones)	378.3	Trig. m.
"	Yerba Buena Island	513.8	Ditto.
"	{Hill at Yerba Buena Cove .....	467.2	Ditto.
Island of Assump- tion, Ladrones .	{Summit of the Cone	2096	Ditto.
Botel Tobago Xima	Peak at W. Angle..	1817	Base at sea.
"	Peak at N.E. Angle exceeded this altitude by about 30 feet.		
Loo Choo .....	Onnodake Mount ..	1089	Trig. m.
"	Abbey Point .....	98.4	Dip of the horizon.
"	Kumi Head .....	99.8	Ditto.
Petropaulski ....	{Villeuchinski (Sugar- Loaf) .....	7374	Trig. m.
"	{Avatcha Mountain, N. by E. of the town}	{1149.1 1161.2 1149.6}	Trig. operation on shore.
Cape Lisburn....	Flint Station .....	849.3	Dip of the horizon.
Kotzebue Sound..	{Hill N. of Spafarief Bay .....	616	Ditto.
"	Chamisso Island ....	231	Ditto.
Port Clarence ...	High Snowy Mountain	2596	Trig. m.
San Blas .....	Commandant's House	141	Dip of the horizon.
"	San Juan Paps .....	{6216 6230}	Trig. m.
Calima Mount. ....		1200.3	Ditto.

**FOSSIL BONES.**—The supposed discovery of fossil bones imbedded in the ice of Escholtz Bay, in West Georgia, had excited much interest among naturalists, both on account of the antiquity which it gave to ice formations, and the light which such a discovery was calculated to throw on the state of the climate of the arctic regions at the time when they were thickly inhabited by genera of the largest quadrupeds. But (as before observed) the visit of the Blossom to these shores has demonstrated that the supposed ice formation is only a casing occurring on the face of a cliff, of from twenty to eighty feet in height, and rising inland to a rounded range of hills, between four and five hundred feet above the sea. The geognostic structure of these cliffs is a bluish-coloured mud or clay, corresponding in character

to our *diluvium*; and the glacial facing, which was easily cut through, appeared to Captain Beechey to be occasioned either by the snow being banked up against the cliff or collected in its hollows in the winter, and converted into ice in the summer by partial thawings and freezings, or by the constant flow of water during the summer over the edges of the cliffs, on which, when converted into ice, the sun's rays operate less forcibly than on other parts. At Blossom Cape, in Kotzebue Bay, the ice, instead of merely forming a shield to the cliff, was imbedded in the indentations along its edges, filling them up nearly even with the point.

The bones found in this deposit of mud and gravel belonged to the elephant, the urus, the deer, and the horse. Some of the tusks examined by Professor Buckland possessed the same double curvature as the tusks of the great elephant in the museum at Petersburg, from the icy cliff at the mouth of the Lena, in Siberia. The head of the musk-ox, brought home with the fossil bones, Professor Buckland says, cannot be considered as fossil. The horns of the deer were similar to those found in the diluvium of England; but there were also the cervical vertebræ of an unknown animal, and which must have differed essentially from any that now inhabit the polar regions of the northern hemisphere.

II.—*A Narrative of a Visit to the Court of Sinde, &c.* By James Burnes, Surgeon to the Residency at Bhooj. Bombay. 1829. Edinburgh. 1831. By W. Ainsworth, Esq.

**S**IND, or Sinde, extends on both sides of the river Indus, called by the Hindoos Sindh, which thus gives its name to the country. It resembles Egypt in the overflowing of the river, in its climate, in some degree in its soil, and also in being confined on one side by a ridge of mountains, and on the other by a desert. Being of classical celebrity, it has long attracted the attention of geographers; but from the opposition offered to research by the prejudices of its oriental possessors, and the predatory habits of its Nomadic tribes, it has remained until very lately quite unexplored. The views of Napoleon, however, on our Indian possessions, first pointed out the necessity of a better acquaintance with a country which forms their western barrier; and we are indebted to the impulse given by these precautionary measures for Colonel Pottinger's account of Sinde, and his subsequent exploration, with Captain Christie, of Belochistan, and a part of Persia. The final occupation of Cutch by the British troops in 1819, further brought our government in connexion with Sinde; and after an unsuccessful